

Three New Species of the Genus *Rhombognathus* (Acari, Halacaridae) from Japan

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ABSTRACT—Three new species of the genus *Rhombognathus* are described from Japan. *Rhombognathus atuy* sp. nov. and *Rhombognathus ezoensis* sp. nov. differ from their congeners in the chaetotaxies of the posterodorsal plate, genital region and legs, and from *Rhombognathus dissociatus* sp. nov. in having three ventral plates.

INTRODUCTION

The genus *Rhombognathus* was established by Trouessart [1]. Only two species of *Rhombognathus* have hitherto been known from waters adjacent to Japan, viz. *Rhombognathus terminalis* and *Rhombognathus denticulatus* described by Sokolov [2] from the Sea of Japan. The present paper describes three new species of this genus collected from marine algae at intertidal zones in Hokkaido, northern Japan.

The type-series is deposited in the collections of the National Science Museum, Tokyo, of the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, and of the National Museum of Natural History, Smithsonian Institution, Washington, DC, U.S.A., and in my private collection.

Terms and the systems of notation for numerical data follow Newell [3-5].

Abbreviations: AD, anterodorsal plate; PD, posterodorsal plate; OC, ocular plate; AE, anterior epimeral plate; PE, posterior epimeral plate; GA, genitoanal plate; ds, dorsal setae; aes-i, anterior epimeral setae; aes-ii-lat (-v, -adj), lateral (ventral, adjunctive) setae of coxae II; pes-iii-lat (-v, adj), lateral (ventral, adjunctive) setae of coxae III; pes-iv, setae of coxae IV; P-1 to P-4, first to fourth segment of palp.

In addition, the following abbreviations are used in the figure legends: Ds, dorsal view; Vr, ventral view; R, right appendage (or part); L, left appendage (or part).

Family **Halacaridae** Murray
Subfamily **Rhombognathinae** Viets
(Japanese name: *Kaisoudani*-aka, new)

Genus ***Rhombognathus*** Trouessart
(Japanese name: *Kaisoudani*-zoku, new)

Rhombognathus atuy sp. nov.
(Japanese name: *Umibe-kaisoudani*, new)
(Figs. 1-4)

Type-series. Holotype: Female, intertidal, on *Sargassum* at 0.5 m depth at low tide, Usu (42°31'N, 140°47'E), Hokkaido, Japan, 10. vii. 1986, H. Abé coll. Allotype: Male, data same as the holotype. Paratypes: 1 female, intertidal, on *Sargassum* at 0.5 m depth in tide pool, Usujiri (41°56'N, 140°57'E), Hokkaido, 12. vi. 1986, H. Abé coll.; 2 males, 1 female, intertidal, on *Corallina* at 0.1 m depth in tide pool, Mitsuishi (42°14'N, 142°36'E), Hokkaido, 8. xii. 1988, H. Abé coll.

Female (holotype). Idiosoma 364 μ m long, 240 μ m wide. Color in life dark green.

Dorsum (Fig. 1A): Dorsal plate ornamented with weak panels, and partly with fine canaliculi. AD and PD separated by interval of approximately PD length. AD 80 μ m long, 110 μ m wide,

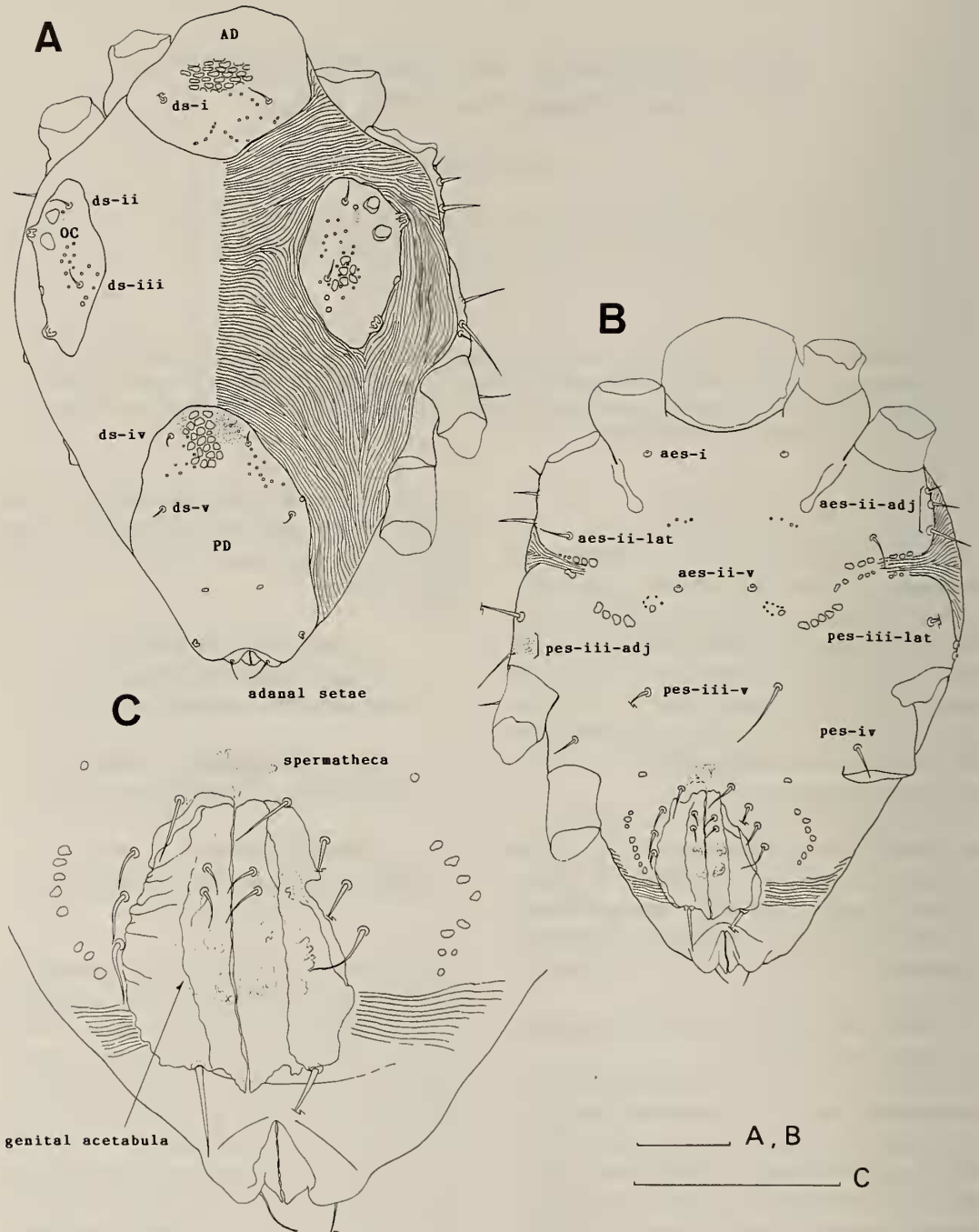


FIG. 1. *Rhombognathus atuy* sp. nov., Female (holotype). A, idiosoma (Ds); B, idiosoma (Vr); C, genitoanal region. Scale bars = 50 μ m.

weakly convex anteriorly and weakly protruded posteriorly, ornamented with chevron-shaped areolation posteriorly, without distinct dorsal

pore. OC 92 μ m long, 50 μ m wide, extending anteriorly to level slightly posterior to posterior margin of AD, reaching posteriorly to level slightly

anterior to insertion of leg III, furnished with two large corneae and two large polygonal pores, bearing one tiny pore-like structure in the vicinity of lateral margin, one maze-like subsurface pore medially to anterior cornea, and two tiny subsurface pores near posteromedial margin. Areolation indistinct. PD 138 μm long, 82 μm wide, reaching anteriorly to level slightly posterior to insertion of leg III, furnished with small subsurface pore at 0.24, tiny areolation at 0.73, and dorsal pore on posterolateral margin on each side. Costae almost parallel, scattered with fine canaliculi. Paracosta lacking.

Chaetotaxy of dorsal region: Setae ds-i on AD, at 0.49, slightly longer and thicker than the others; ds-ii each on OC near anteromedial corner at 0.13; ds-iii each on OC near posteromedial margin at 0.61; ds-iv and ds-v on PD at 0.18 and 0.44, respectively.

Venter (Fig. 1B): Epimeral, genital and anal plates fused to form a single plate. Ornamentation indistinct, but very faintly reticulated in part. Epimeral region furnished with membranous collar anteriorly, several subsurface pores medially, and elongate subsurface structure between insertions of leg I and leg II on each side, incised laterally with membranous cuticle with bordering several subsurface pores at level midway between insertions of leg II and leg III.

Chaetotaxy of epimeral region: Setae aes-i at level slightly anterior to insertion of leg II; aes-ii-lat placed medially at level slightly anterior to lateral incision; aes-ii-v placed most medially at level slightly posterior to lateral incision; aes-ii-adj located on lateral margins, each consisting of three setae; pes-iii-lat placed near lateral margins, at level midway between lateral incision and insertion of leg III; pes-iii-v placed medially, at level of insertion of leg III; pes-iv located at level slightly anterior to insertion of leg IV; pes-iii-adj placed dorsolaterally, each consisting of two thick setae.

Genitoanal region (Fig. 1C): Genital region slightly incised laterally with membranous cuticle at level of posterior portion of genital foramen, furnished with a round subsurface pore, and a series of polygonal subsurface pores on each side of genital foramen. Genital foramen 70 μm long, 54 μm wide, oval, occupying from level slightly

posterior to insertion of leg IV to level anterior to anal papilla. Genital sclerites band-like, with membranous wide fringe. Genital acetabula internal, three pairs. Spermatheca bilobed, extending to level of insertion of leg IV. Ovipositor placed inside of genital foramen. Anal papilla somewhat swollen, placed terminally.

Chaetotaxy of genitoanal region: Five pairs of long thick filiform perigenital setae located around genital foramen as arranged in Figure 1C. Subgenital setae filiform; two setae on each genital sclerite, arrange 2-0. Adanal setae one pair, very fine, placed on anal papilla dorsoproximally.

Gnathosoma (Fig. 2A): 72 μm long, 72 μm wide, gnathosomal-length/idiosomal-length 0.20. Base, length/width 0.53, slightly expanded laterally, lacking seta, ornamented with fine punctations and a few round thin panels. Pharyngeal plate elongate, furnished with three longitudinal stems and double row of several minute filamentous subsurface structures. Anterior margin of tectum with three acute points. Rostrum approximately 34 μm long, 17 μm wide, nearly lanceolate, not reaching to level of distal end of palp. Rostral setae two pairs as follows: Proximal pair long and robust, at just anterior to swollen point; distal pair short, at just anterior to proximal pair. Rostral sulcus short, barely reaching to level of proximal rostral setae. Chelicera (Fig. 2B) elongate, with basal segment 68 μm long, 24 μm wide without clear ornamentation. Movable digit 16 μm long, with 11-12 minute denticles along dorsal edge. Fixed digit 13 μm long, extending distally to mid-level of movable digit. Palp (Fig. 2C), 30 μm long; P-1, length/width 0.38, short and cylindrical; P-2, length/width 0.42, longest and robust, very weakly reticulated, with a seta distidorsally; P-3, length/width 0.29, short and cylindrical; P-4, length/width 1.75, conical, with three short and thick filiform setae intermediately, and two appressed blunt spiniform projections terminally.

Legs (Fig. 3A-D): Length of legs I, II, III, IV = 240, 236, 236, 248 μm , respectively. Ornamentation indistinct. Each tarsus furnished with claw fossa, without ventral seta. Lateral claw with rake-like accessory process, bearing nine to twelve delicate teeth. Median claw and comb absent. Carpites short and rod-like. Cavity in claw present.

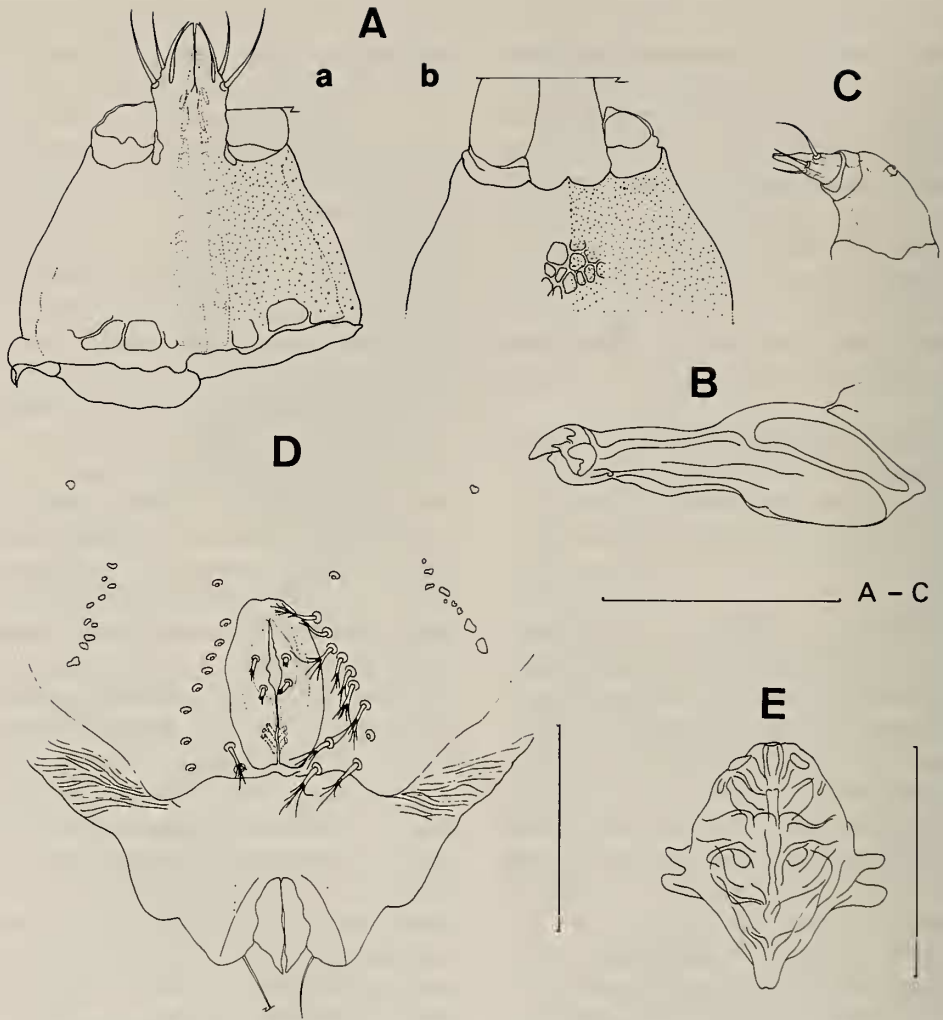


FIG. 2. *Rhombognathus atuy* sp. nov., Female (holotype). A, gnathosoma (a-Vr, b-Ds); B, chelicera (R); C, palp (R). Male (allotype). D, genitoanal region; E, spermatophorotype. Scale bars = 50 μ m.

Short seta usually faintly rough, long seta smooth.

Leg chaetotaxy as follows: Trochanters I-IV, 1-1-1-0; basifemora, 2-3-2-2; telofemora, 7-7-5-4; genua, 5-5-3-4; tibiae, 6-6-5-5. As for large bipectinate seta: Tibiae I-IV, 2-1-1-1. Tarsus I (Fig. 4A) with three dorsal setae, one solenidion, one famulus, and four parambulacral setae (paired doublet euphathidia). Solenidion long bacilliform on posterodorsal surface of claw fossa. Famulus papilliform with fine canaliculus at just ventroproximally to solenidion. Tarsus II (Fig. 4B) with three dorsal setae, one solenidion, and four parambulacral setae. Solenidion long bacilliform on

posterodorsal surface of claw fossa. Tarsus III (Fig. 4C) with four dorsal setae, and two parambulacral setae (one single euphathidium on posterior surface, one bud-shaped proeuphathidium on anterior surface). Tarsus IV (Fig. 4D) with three dorsal setae (one long thick filiform seta on basidorsal limb, one froned seta on claw fossa, one fine filiform seta on anterodorsal surface), and two parambulacral setae (one single euphathidium on posterior surface, one bud-shaped proeuphathidium on anterior surface).

Male (allotype). Idiosoma 360 μ m long, 240 μ m wide, gnathosomal-length/idiosomal-length 0.19,

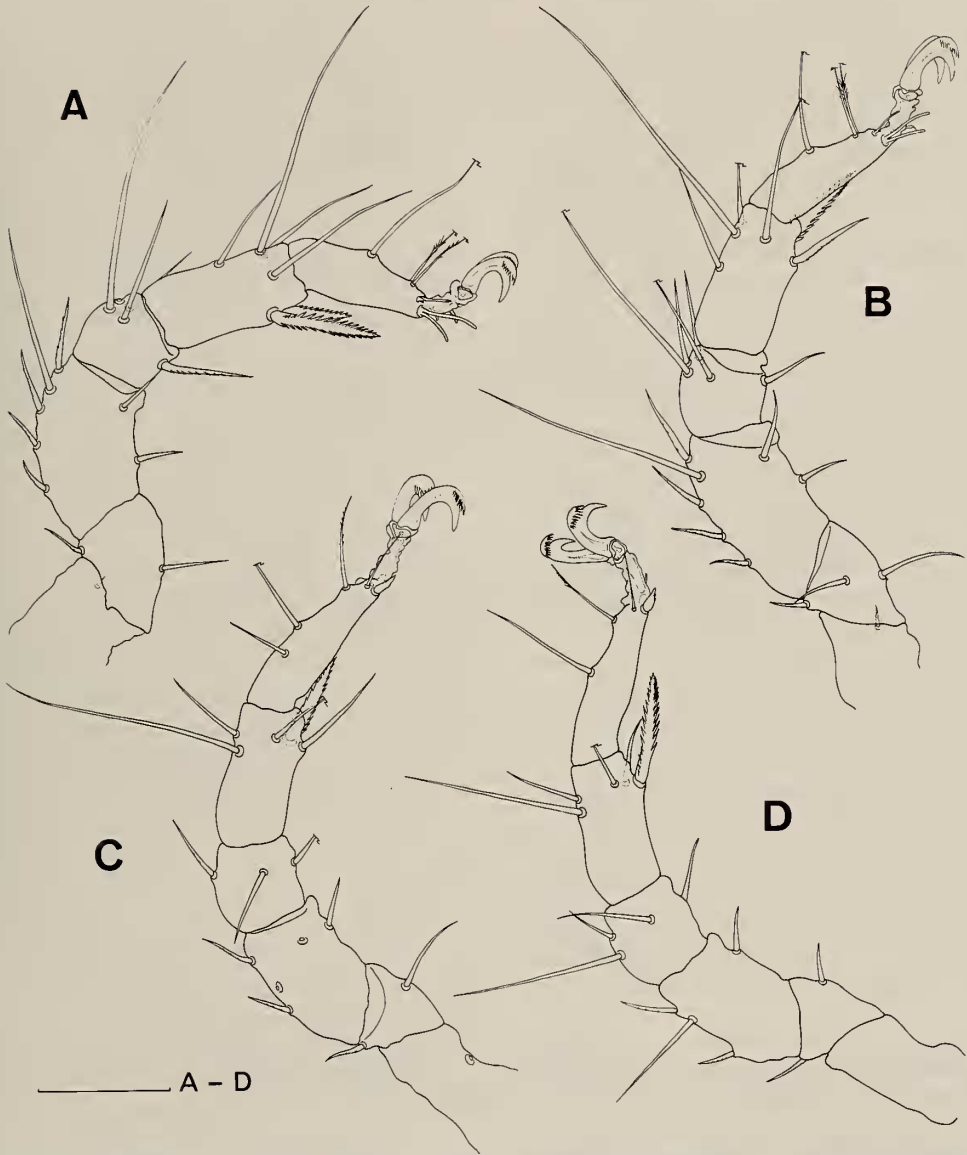


FIG. 3. *Rhombognathus atuy* sp. nov., Female (holotype). A, leg I (R); B, leg II (R); C, leg III (L), D, leg IV (L). Scale bar=50 μ m.

resembling the female in essential respects except for characters of genitoanal region, and chaetotaxy of tarsus IV.

Genitoanal region (Fig. 2D) furnished with a round subsurface pore, a series of polygonal subsurface pores, and very faint panels on each side of genital foramen, bearing terminally tufted 11 and 12 perigenital setae as arranged in Figure 2D. Genital foramen 50 μ m long, 24 μ m wide. Sub-

genital setae divided terminally; two setae on each genital sclerite, arranged 2-0. Genital acetabula internal, three pairs. Spermatophorotype (Fig. 2E) 62 μ m long, 50 μ m wide, massive and obovate.

Tarsus IV (Fig. 4E) furnished with three dorsal setae (one long thick filiform seta on basidorsal limb, one froned seta on claw fossa, one delicate branched seta on anterodorsal surface of claw

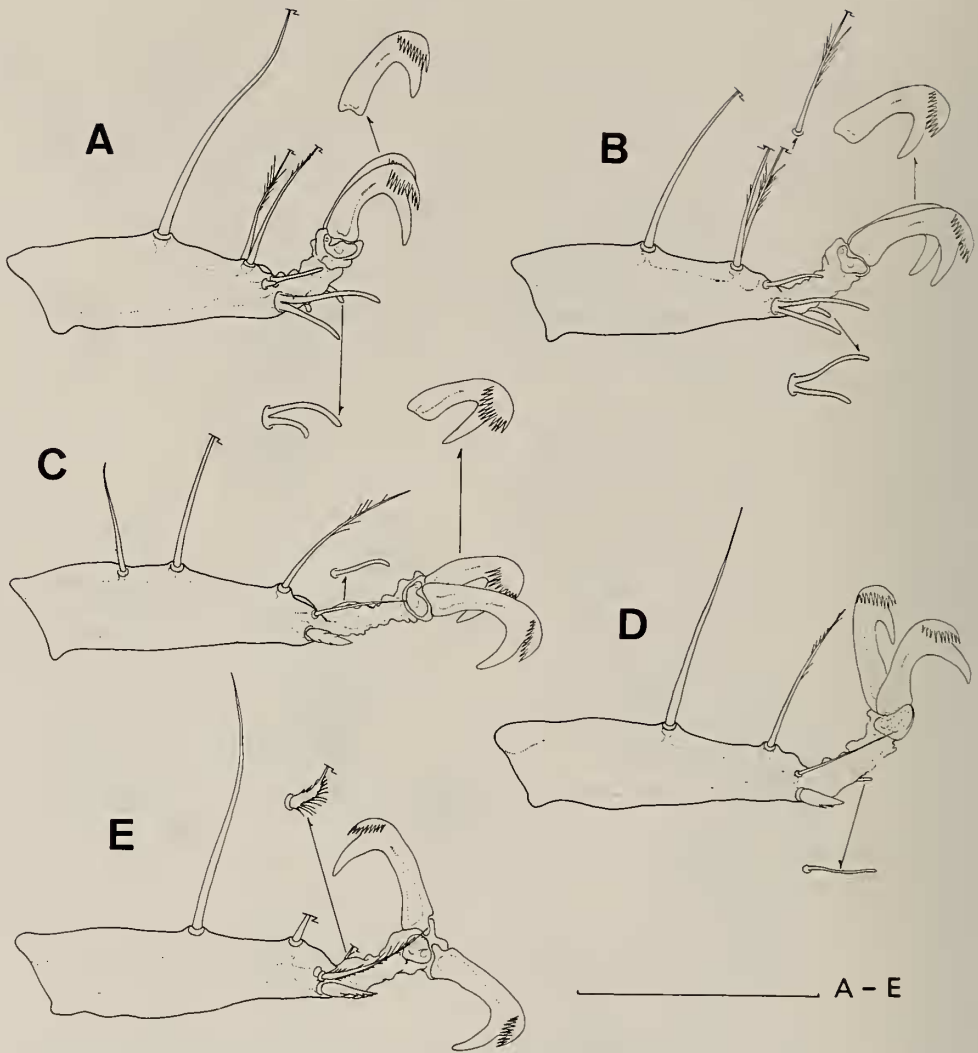


FIG. 4. *Rhombognathus atuy* sp. nov., Female (holotype). A, tarsus I (R); B, tarsus II (R); C, tarsus III (L); D, tarsus IV (L). Male (allotype). E, tarsus IV (L). Scale bar=50 μ m.

fossa), two parambulacral setae (one long plumose proeuphathidium on posterior surface, one bud-shaped proeuphathidium on anterior surface).

Immatures: Not collected.

Morphological variation and abnormality: The number of setae *aes-ii-adj* and *pes-iii-adj* on each side of the idiosoma varies from two to three, and one to two, respectively. The number of the perigenital setae on each side of the genital foramen varies from 11 to 12 in the male, five to six in the female. The leg chaetotaxy varies among specimens as follows: Trochanters I-IV, (0,1)-

(0,1)-1-0; telofemora, 7-(6,7)-5-4; genua, 5-(4,5)-3-4; tibiae, 6-6-(5,6)-5. One specimen lacks the dorsoproximal seta on tarsus III.

Etymology: The specific epithet is derived from "Atuy" which means the sea in the language of the Ainu (native people in northern Japan).

Distribution: Pacific coast of Hokkaido, northern Japan.

Remarks: *Rhombognathus atuy* is distinguishable from other *Rhombognathus* species by the following characters: Separated dorsal plates, PD with two pairs of setae, arrangements of perigenit-

al setae in the both sexes (Figs. 1C, 2D), leg chaetotaxy, and rake-like accessory process.

Among the *Rhombognathus* species characterized by having five perigenital setae in the female, *Rhombognathus atuy* resembles *R. caudiculus* Bartsch, 1983 [6] in the arrangement of these setae. However, *R. atuy* is easily discernible from *caudiculus* by the following characters (corresponding condition in the latter species in parentheses): (1) Two pairs of dorsal setae on PD (one pair); (2) rostrum lanceolate and shorter than the length of the base of gnathosoma (elongate, longer than the length of the base of gnathosoma); (3) two pairs of basal perigenital setae located near the posterior site of genital foramen in the male (one pair); (4) tibiae I-IV with 2-1-1-1 large bipectinate setae (tibiae I-IV with 2-1-1-2); (5) accessory process rake-like (not developed).

Moreover, *Rhombognathus atuy* is similar to *R. robustus* Bartsch, 1977 [7] in the arrangement of the perigenital setae in the male. However, *R. atuy* differs from *robustus* in the arrangement of the perigenital setae in the female (four pairs anteriorly, one pair posteriorly to genital foramen in *atuy*; two pairs anteriorly, three pairs posteriorly in *robustus*), in the developed accessory process, and in having tibiae I-IV with 2-1-1-1 large bipectinate setae.

Rhombognathus sandwichi Newell, 1984 [5] also has two pairs of basal perigenital setae in the male as in *R. atuy*, although the arrangement of these setae is not clear because no illustration was given. However, the two species clearly differ from each other in the shape and arrangement of the dorsal plates and leg chaetotaxy.

Rhombognathus dissociatus sp. nov.

(Japanese name: *Wakare-kaisoudani*, new)

(Figs. 5-8)

Type-series. Holotype: Female, intertidal, on *Sargassum* exposed on ledge at low tide, Shamodomari, Oshoro Bay (43°12', 140°51'E), Hokkaido, 21. ii. 1987, H. Abé coll. Allotype: Male, intertidal, on *Polysiphonia* at 0.3 m depth in tide pool Poromai, Oshoro Bay, 6. iii. 1989, H. Abé coll. Paratypes: 1 female, 4 males, data same as the allotype; 1 female, intertidal, among *Sargassum*

belt in crevice at low tide, Kabuto Rock, Oshoro Bay, 15. iv. 1986, H. Abé coll.; 1 female, intertidal, on *Rhodomela* at 0.3 m depth in tide pool, Kabuto Rock, Oshoro Bay, 21. ii. 1987, H. Abé coll.; 1 female, intertidal, on *Sargassum* exposed on ledge at low tide, Kikonai (41°42'N, 140°32'E), Hokkaido, 16. v. 1987, H. Abé coll.

Female (holotype). Idiosoma 472 μm long, 316 μm wide. Color in life dark green.

Dorsum (Fig. 5A): Dorsal plate ornamented with clear panels, and partly with fine canaliculi. AD and PD separated by interval of approximately PD length. AD 100 μm long, 116 μm wide, strongly protruded anteriorly, and truncated posteriorly, reaching posteriorly to level of insertion of leg II, ornamented with triangular areolation at posterior portion, with a large pore near each lateral margin at 0.44. OC 114 μm long, 60 μm wide, extending posteriorly to level slightly anterior to insertion of leg III, furnished with two large corneae, two large polygonal pores, bearing one maze-like subsurface pore just posteromedially to anterior cornea, one pore-like angular structure near lateral margin at 0.70, and two tiny subsurface pores near posteromedial margin. Areolation not seen. PD 176 μm long, 176 μm wide, protruded anteriorly, slightly concave posteriorly, reaching anteriorly to level of insertion of leg III, furnished with a large dorsal pore at 0.91, and a tiny areolation at 0.89 on each side. Costae almost parallel and scattered with fine canaliculi. Paracosta lacking.

Chaetotaxy of dorsal region: Setae ds-i on AD at 0.54, longer and thicker than the others; ds-ii each on OC near anteromedial corner at 0.11; ds-iii each on OC near medial margin at 0.49; ds-iv and ds-v on PD at 0.23 and 0.59, respectively.

Venter (Fig. 5B): Membranous cuticle clearly striated. Ventral plates three in number, completely separated, and entirely ornamented with porous panels. PE and genital plate fused to form a single middle plate. AE and middle plate separated from each other by a strip of membranous cuticle. AE 100 μm long, 276 μm wide, convex posteriorly, reaching posteriorly to level about midway between insertions of leg II and leg III, furnished with wide thin membranous collar anteriorly, several subsurface pores along post-

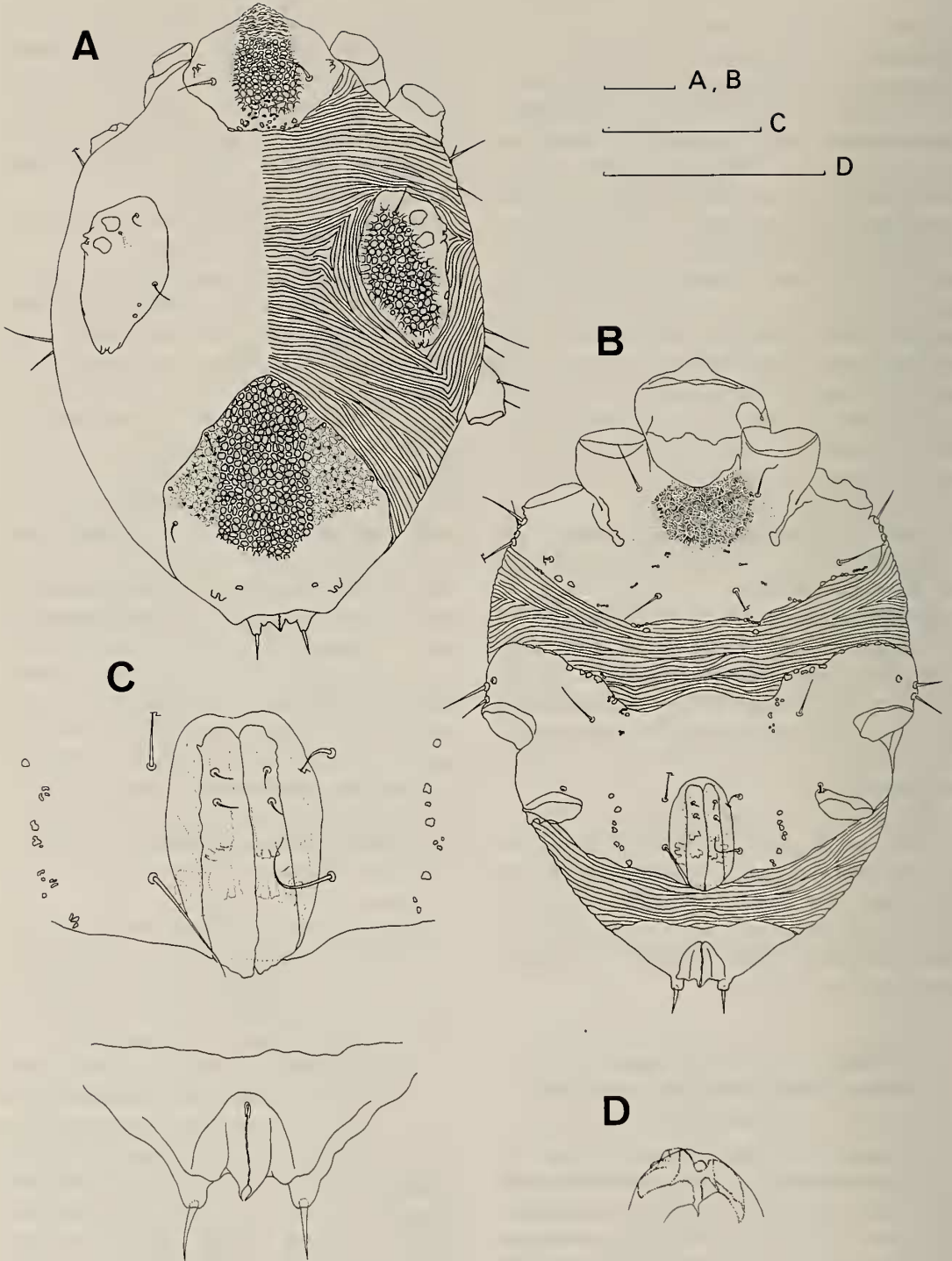


FIG. 5. *Rhombognathus dissociatus* sp. nov., Female (holotype). A, idiosoma (Ds); B, idiosoma (Vr); C, genitoanal region; D, spermatheca. Scale bars = 50 μ m.

erior margin, and elongate subsurface structure between insertions of leg I and leg II on each side. A round subsurface pore located on striated membranous cuticle medially on each side, at just posterior to posterior margin of AE. Middle plate 152 μm long, 316 μm wide, concave anteriorly, convex posteriorly, reaching posteriorly to about mid-level between insertion of leg IV and the end of idiosoma, ornamented with several subsurface pores along boundary between each posterior epimeral region and genital region. Anal plate 46 μm long, 122 μm wide, surrounding anal pailla, completely separated from genital region by a strip

of striated membranous cuticle.

Chaetotaxy of epimeral region: Setae *aes-i* on AE, at level slightly anterior to insertion of leg II; *aes-ii-lat* on AE, near posterolateral corners; *aes-ii-v* on AE, near posterior margin; *aes-ii-adj* placed on lateral margins (three setae on left side, four setae on right side); *pes-iii-lat* on middle plate, located near lateral margins, at mid-level between anterior margin of middle plate and insertion of leg III; *pes-iii-v* on middle plate, at level of insertion of leg III; *pes-iv* on middle plate, at level just anterior to insertion of leg IV; *pes-iii-adj* placed on lateral margins of middle plate, each

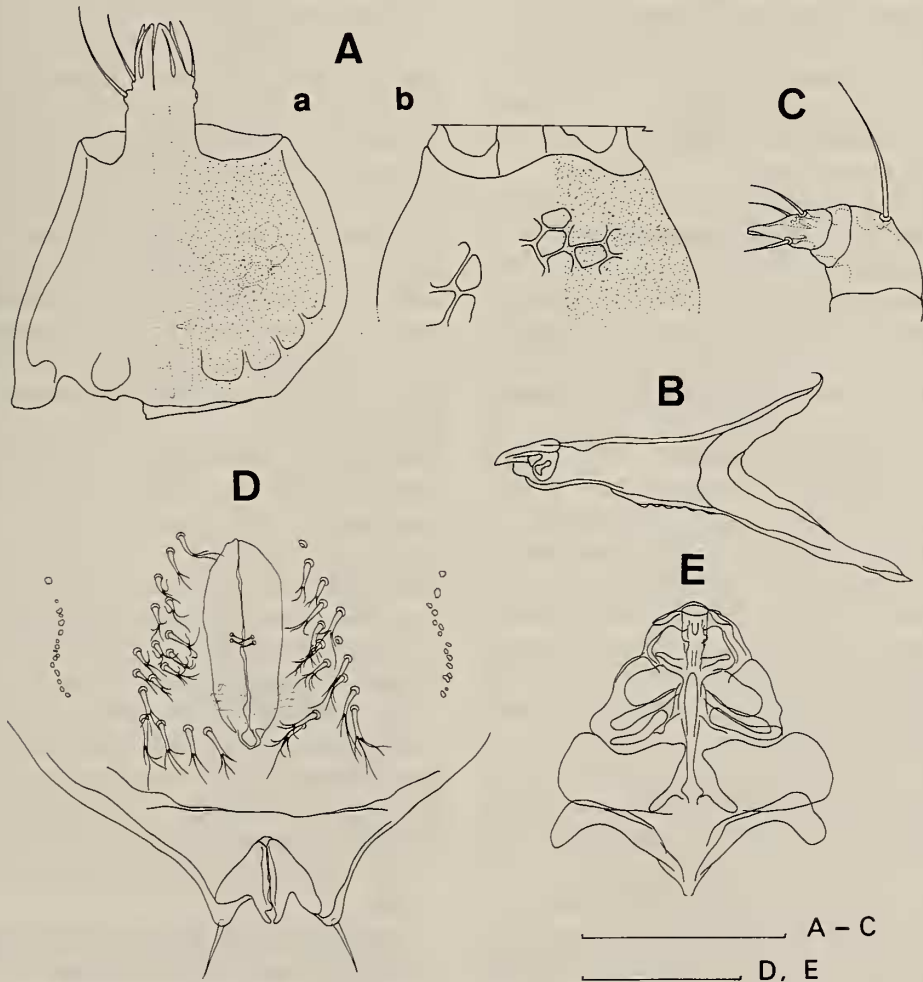


FIG. 6. *Rhombognathus dissociatus* sp. nov., Female (holotype). A, gnathosoma (a-Vr, b-Ds); B, chelicera (R) [broken basally]; C, palp (R). Male (allotype). D, genitoanal region; E, spermatophorotype. Scale bars = 50 μm .

consisting of two thick setae.

Genitoanal region (Fig. 5C): Genital region occupying medial portion of middle plate, furnished with a round subsurface pore, and a series of polygonal subsurface pores on each side of genital foramen. Genital foramen $88\ \mu\text{m}$ long, $48\ \mu\text{m}$ wide, elliptical, located posteromedially on middle plate. Genital sclerites band-like, extending posteriorly somewhat beyond posterior margin of middle plate. Genital acetabula internal, three pairs. Spermatheca (Fig. 5D) bilobed, not extending anteriorly from anterior margin of genital foramen. Ovipositor placed inside of genital foramen. Anal papilla placed terminally on anal plate.

Chaetotaxy of genitoanal region: Two pairs of long filiform perigenital setae located near genital foramen as arranged in Figure 5C. Subgenital setae short, filiform; two setae on each genital sclerite, arranged 2-0. Adanal setae one pair, robust, placed distadorsally.

Gnathosoma (Fig. 6A): $94\ \mu\text{m}$ long, $88\ \mu\text{m}$ wide, gnathosomal-length/idiosomal-length 0.20. Base, length/width 0.65, slightly expanded laterally, lacking seta, ornamented with fine punctations and several panels. Pharyngeal plate elongate, furnished with three longitudinal stems, and double row of several fine filamentous subsurface structures. Anterior margin of tectum weakly convex. Rostrum approximately $37\ \mu\text{m}$ long, $20\ \mu\text{m}$ wide, elongate, not reaching to level of distal end of palp. Rostral setae two pairs as follows: Proximal pair long and robust, at half level of rostrum; distal pair at just anterior to proximal pair, about $2/3$ length of proximal pair. Rostral sulcus short, barely reaching to level of proximal rostral setae. Chelicera (Fig. 6B) elongate, with basal segment $86\ \mu\text{m}$ long, without clear ornamentation. Movable digit $18\ \mu\text{m}$ long, with 12-13 minute denticles along dorsal edge. Fixed digit $15\ \mu\text{m}$ long, extending distally to about midway of denticulate dorsal margin of movable digit. Palp (Fig. 6C) $38\ \mu\text{m}$ long; P-1, length/width 0.33, short and cylindrical; P-2, length/width 0.50, longest and robust, weakly reticulated with porous panels, with long thick filiform seta dorsally; P-3, length/width 0.31, short and cylindrical; P-4, length/width 0.59, conical, with three short and thick filiform setae intermediately, and two appressed blunt

spiniform projection terminally.

Legs (Fig. 7A-D): Length of legs I, II, III, IV = 244, 246, 230, $236\ \mu\text{m}$, respectively, ornamented with fine porous panels which are clear only on telofemora. Each Tarsus furnished with claw fossa, lacking ventral seta. Lateral claw with tiny rake-like accessory process bearing five to seven very minute and fine teeth. Median claw and comb absent. Carpite short and rod-like. Cavity in claw present. Short seta usually faintly rough, long seta smooth.

Leg chaetotaxy as follows: Trochanters I-IV, 1-1-2-0; basifemora, 2-3-2-2; telofemora, 7-7-5-6; genua, 6-6-4-5; tibiae, 6-6-5-5. As for large bipectinate seta: Genua I-IV, 1-0-0-0; tibiae, 2-2-2-2; each one bipectinate seta on tibia II and tibia III weakly pectinated. Tarsus I (Fig. 8A) with three dorsal setae, one solenidion, one famulus, and four parambulacral setae (paired doublet euphathidia). Solenidion long straight bacilliform, on posterodorsal surface of claw fossa. Famulus papilliform with fine canaliculus, at just ventrally to solenidion. Tarsus II (Fig. 8B) with three dorsal setae, one solenidion, and four parambulacral setae. Solenidion long bacilliform on posterodorsal surface of claw fossa. Tarsus III (Fig. 8C) with four dorsal setae, and two parambulacral setae (one single filiform proeuphathidium on posterior surface, one bud-shaped proeuphathidium on anterior surface). Tarsus IV (Fig. 8D) with three dorsal setae (one lone thick filiform seta on basidorsal limb, one long serrated seta on claw fossa, one straight fine filiform seta on anterodorsal surface), two parambulacral setae (one straight fine filiform proeuphathidium on posterior surface, one bud-shaped proeuphathidium on anterior surface).

Male (allotype). Idiosoma $400\ \mu\text{m}$ long, $240\ \mu\text{m}$ wide, gnathosomal-length/idiosomal-length 0.22, resembling the female in essential respects except for characters of body size, genitoanal region, and chaetotaxy of tarsus IV.

Body size somewhat smaller than that in the female.

Genitoanal region (Fig. 6D) furnished with a series of polygonal subsurface pores, and terminally tufted 15 and 17 perigenital setae as arranged in Figure 6D. Genital foramen $72\ \mu\text{m}$ long, $26\ \mu\text{m}$ wide. Subgenital setae short, filiform; two setae at

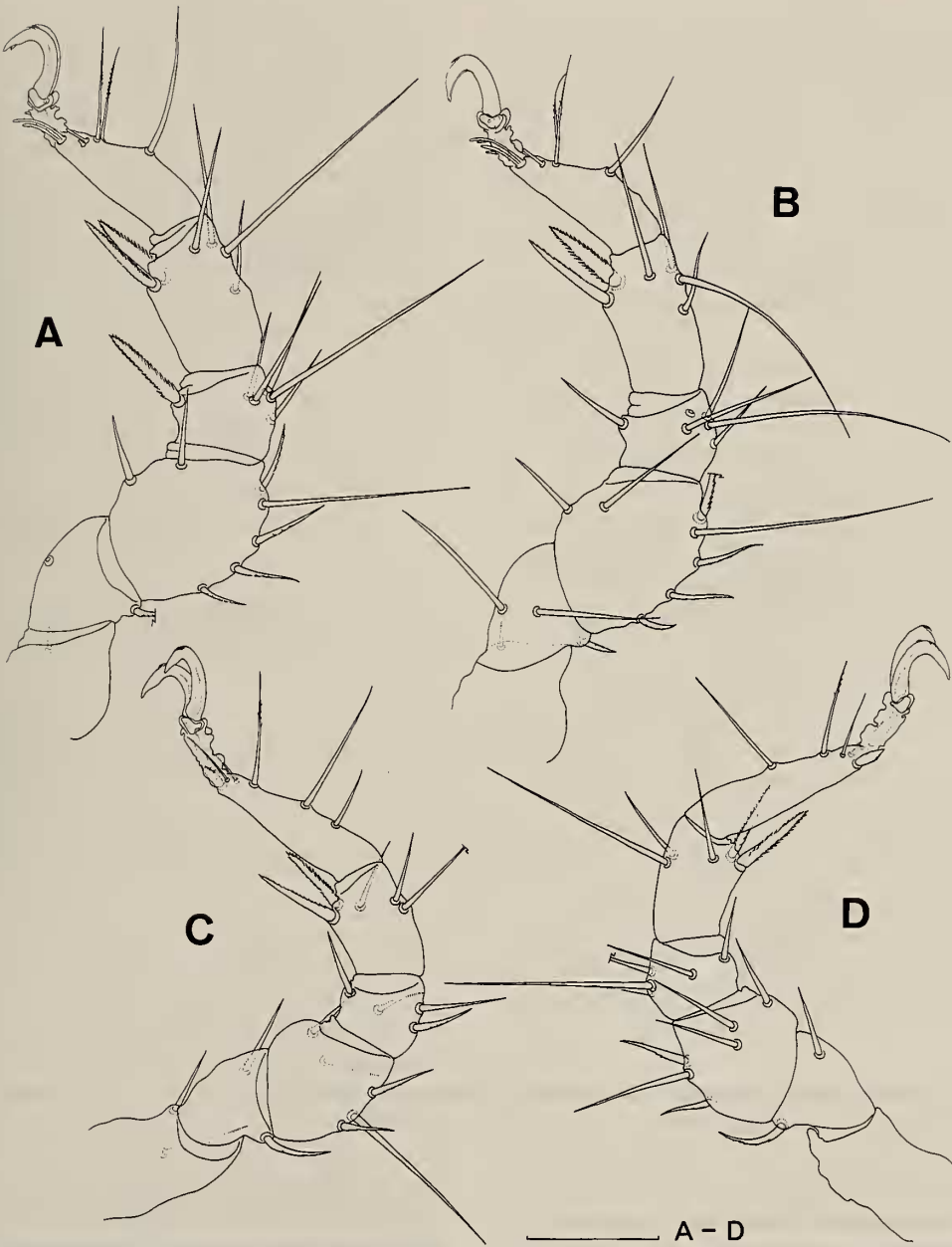


FIG. 7. *Rhombognathus dissociatus* sp. nov., Female (holotype). A, leg I (L); B, leg II (L); C, leg III (L); D, leg VI (L).

mid-level on each genital sclerite, arranged 2-0. Genital acetabula internal, three pairs. Anal plate not so clearly separated from middle plate as that in the female. Spermatophorotype (Fig. 6E) 88 μm long, 84 μm wide, very massive.

Tarsus IV (Fig. 8E) furnished with three dorsal setae (one long thick filiform seta on basidorsal limb, one fronded seta on claw fossa, one branched seta on anterodorsal surface of claw fossa), two parambulacral setae (one long branched

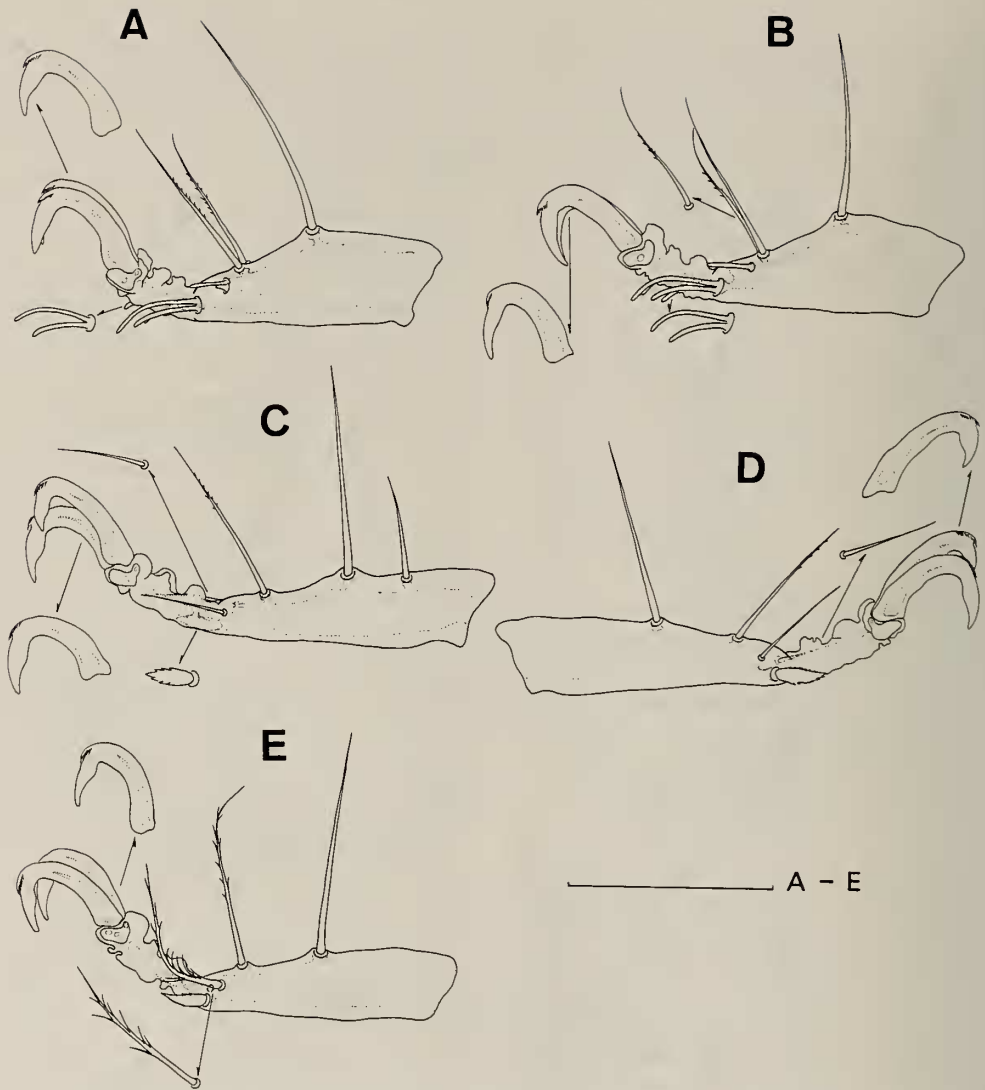


FIG. 8. *Rhombognathus dissociatus* sp. nov., Female (holotype). A, tarsus I (L); B, tarsus II (L); C, tarsus III (L); D, tarsus IV (L). Male (allotype). E, tarsus IV (R). Scale bar = 50 μ m.

proeuphathidium on posterior surface, one bud-shaped proeuphathidium on anterior surface).

Immatures: Not collected.

Morphological variation and abnormality: The holotype female specimen has four aes-ii-adj setae on right lateral margin of AE. However, all other specimens examined have three aes-ii-adj (the anteriormost seta shortest, the posteriormost longest) on each lateral side of AE. One specimen has two maze-like subsurface pores on left OC, and no ds-iii. The number of the perigenital setae

on each side of the genital foramen varies from 14 to 25 in the male; this number varies not only according to specimens, but also within one specimen. The leg chaetotaxy varies as follows: Trochanters I-IV, (6,7)-(7,8)-(5,6)-(4,5,6,7); genua, (5,6)-(5,6)-(3,4)-(4,5,6); tibiae, 6-6-5-(5,6). One specimen has only one large bipectinate seta on tibia III, and tibia IV, respectively.

Etymology: The specific epithet is derived from "the dissociated ventral plates".

Distribution: The Japan Sea coast of Hokkaido.

Remarks: This new species obviously belongs to the genus *Rhombognathus* on the grounds that (1) the genital foramen is placed ventrally (not terminally) and guarded by band-like (not cusp-like) genital sclerites, (2) each ocular plate has two setae, and (3) all legs have two claws. All the hitherto named species of *Rhombognathus* have one, two, or five ventral plates in the adult, and have more than three pairs of perigenital setae in the female. However, the species is unique in the following characters: (1) the venter is covered with three ventral plates (anterior epimeral plate, a middle plate consisting of posterior epimeral plates and a genital plate, and anal plate); (2) two pairs of perigenital setae in the female as shown in Figure 5 C; (3) the leg chaetotaxy is distinctive in having trochanters I-IV with 1-1-2-0 setae.

Rhombognathus ezoensis sp. nov.

(Japanese name: *Ezo-kaisoudani*, new)

(Figs. 9-12)

Type-series. Holotype: Female, intertidal, on *Sargassum* on boulder at 0.2 m depth at high tide, Shamodomari, Oshoro Bay, Hokkaido, 23. vi. 1987, H. Abé coll. Allotype: Male, intertidal, on *Sargassum* on boulders at 0.3 m depth at low tide, Shamodomari, Oshoro Bay, 21. ii. 1987, H. Abé coll. Paratypes: 1 female, 2 tritonymphs, 2 deutonymphs, data same as the holotype; 1 male, 2 females intertidal, among *Sargassum* belt at 0.5 m depth at low tide, Ebisu Rock, Oshoro Bay, 15. iv. 1986, H. Abé coll.; 2 females, intertidal, on *Sargassum* at 0.3 m depth in tide pool, Kabuto Rock, Oshoro Bay, 21. ii. 1987, H. Abé coll.; 1 male, intertidal, on *Sargassum* at 0.5 m depth in tide pool, Usujiri, Hokkaido, 12. vi. 1986, H. Abé coll.; 1 female, intertidal, on *Sargassum* exposed on ledge at low tide, Kikonai, Hokkaido, 16. v. 1987, H. Abé coll.; 2 males, 2 females, intertidal, on *Corallina* at 0.1 m depth in tide pool, Mitsuishi, Hokkaido, 8. xii. 1988, H. Abé coll.

Female (holotype). Idiosoma 388 μm long, 256 μm wide. Color in life dark green with a fine dorsal semitransparent line longitudinally.

Dorsum (Fig. 9A): Dorsal plate uniformly ornamented with clear panels, and partly with fine canaliculi. Ad and PD separated by interval of

approximately two times as long as AD. AD 80 μm long, 100 μm wide, almost truncated anteriorly and posteriorly, ornamented with fine areolation at posterior portion, without clear dorsal pore. OC 96 μm long, 52 μm wide, extending anteriorly to level slightly posterior to posterior margin of AD, reaching posteriorly to level slightly anterior to insertion of leg III, furnished with two large corneae, two large polygonal pores, bearing one angular pore-like structure near lateral margin, one maze-like subsurface pore medially to corneae, and three tiny subsurface pores near posteromedial margin. Areolation not seen. PD 164 μm long, 120 μm wide, extending anteriorly to level of insertion of leg IV, furnished with a small subsurface pore at anterolateral corner, and a dorsal pore on posterolateral margin on each side. Areolation not clear. Costae almost parallel and scattered with fine canaliculi. Paracosta lacking.

Chaetotaxy of dorsal region: Setae ds-i on AD at 0.43, longer and thicker than the others; ds-ii each on OC near anterior margin at 0.08; ds-iii each on OC near medial margin at 0.52; ds-iv and ds-v on PD at 0.14 and 0.47, respectively.

Venter (Fig. 9B): Epimeral, genital, and anal plates fused to form a single plate which is entirely reticulated with faint panels. Epimeral region furnished with membranous collar anteriorly, several subsurface pores medially, and elongate subsurface structure between insertions of leg I and leg II on each side, incised laterally with membranous cuticle with bordering several subsurface pores at mid-level between insertions of leg II and leg III.

Chaetotaxy of epimeral region: Setae aes-i at level slightly anterior to insertion of leg II; aes-ii-lat placed medially at level slightly anterior to lateral incision; aes-ii-v located medially at level of anterior margin of lateral incision; aes-ii-adj placed near lateral margins, each consisting of three setae on left, whereas two setae on right; pes-iii-lat placed near lateral margins, at mid-level between lateral incision and insertion of leg III; pes-iii-v placed medially at level of insertion of leg III; pes-iv placed slightly anterior to insertion of leg IV; pes-iii-adj located dorsolaterally, each consisting of two setae.

Genitoanal region (Fig. 9C): Genital region

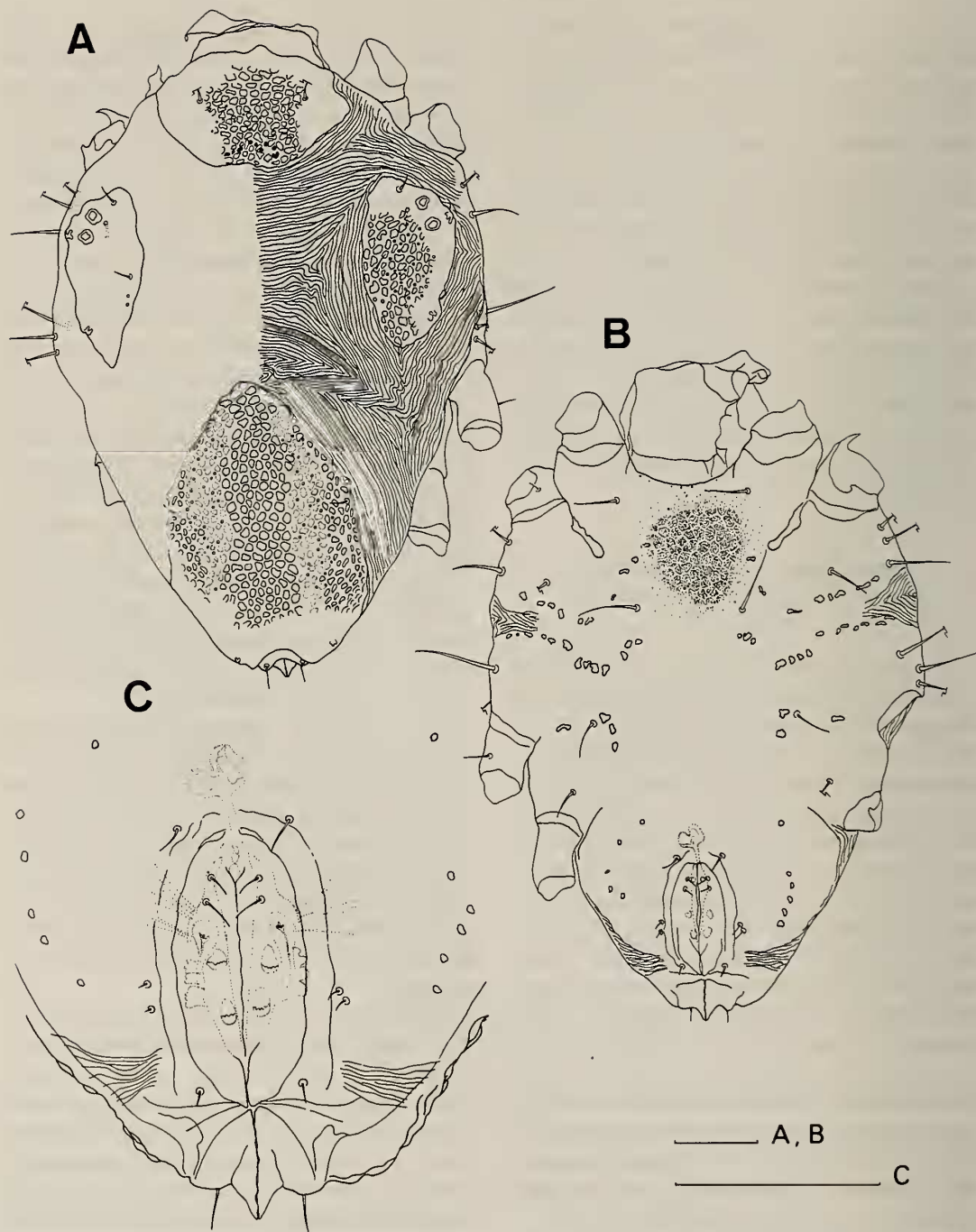


FIG. 9. *Rhombognathus ezoensis* sp. nov., Female (holotype). A, idiosoma (Ds); B, idiosoma (Vr); C, genitoanal region. Scale bars = 50 μ m.

slightly incised laterally with membranous cuticle at level of posterior portion of genital foramen, furnished with a round subsurface pore, and a

series of several subsurface pores on each side of genital foramen. Genital foramen 66 μ m long, 40 μ m wide, subelliptical, reaching to level slightly

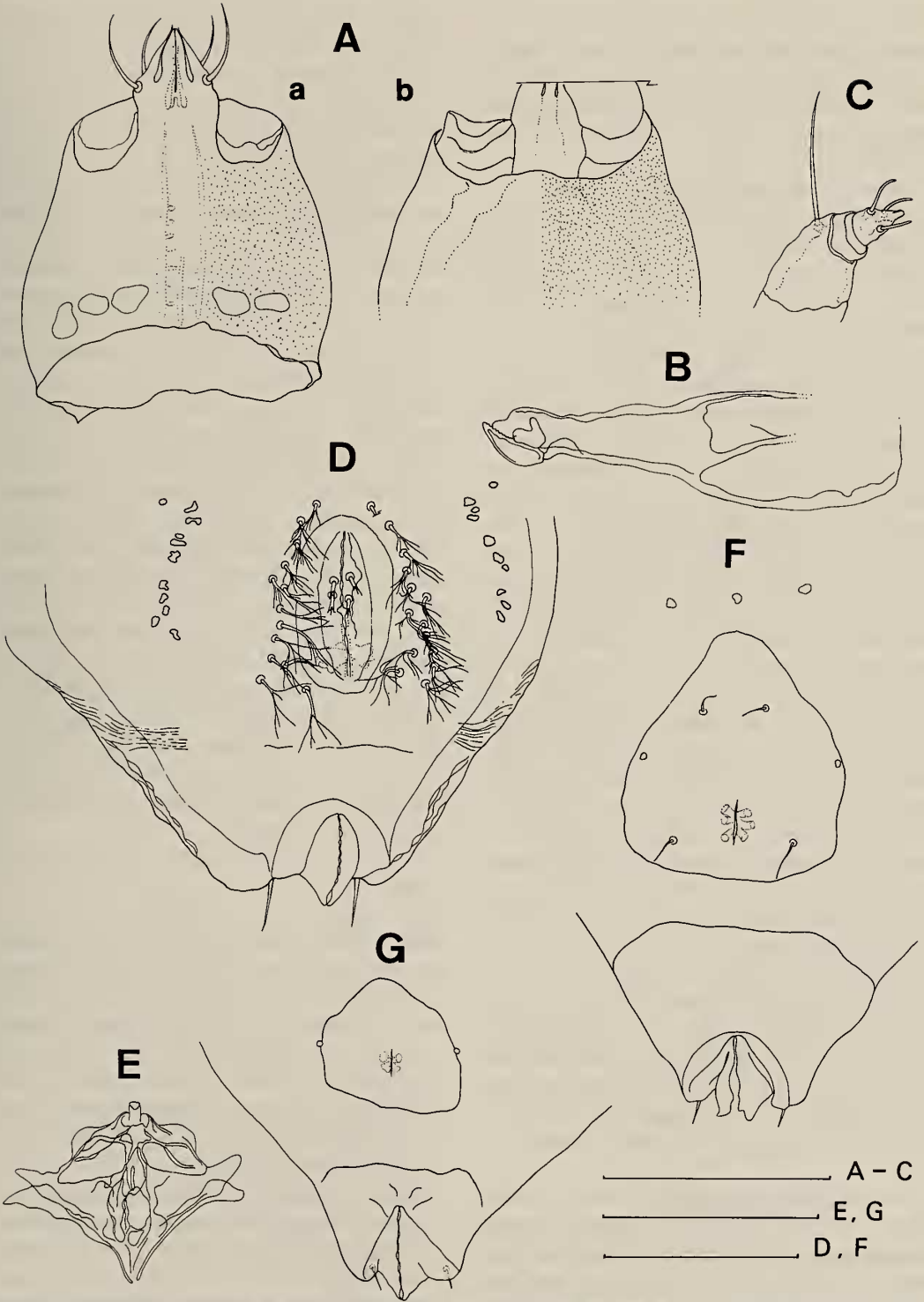


FIG. 10. *Rhombognathus ezoensis* sp. nov., Female (holotype). A, gnathosoma (a-Vr, b-Ds); B, chelicera (R); C, palp (R). Male (allotype). D, genitoanal region; E, spermatophorotype. Tritonymph (paratype). F, genitoanal region. Deutonymph (paratype). G, genitoanal region. Scale bars=50 μ m.

anterior to anal papilla, furnished with band-like genital sclerites and three pairs of internal genital acetabula. Spermatheca bilobed, extending to level of insertion of leg IV. Ovipositor placed inside of genital foramen. Anal papilla placed terminally.

Chaetotaxy of genitoanal region: Four pairs of short filiform perigenital setae located in the vicinity of genital foramen as arranged in Figure 9 C. Subgenital setae filiform; two setae on each genital sclerite, arranged 2-0. Adanal setae one pair, placed on anal papilla dorsoproximally.

Gnathosoma (Fig. 10A): 76 μm long, 70 μm wide, gnathosomal-length/idiosomal-length 0.20. Base, length/width 0.51, slightly expanded laterally, lacking seta, ornamented with fine punctations, and a few round panels on ventroproximal site. Pharyngeal plate elongate, furnished with three longitudinal stems, and double row of several minute filamentous subsurface structures. Anterior margin of tectum weakly convex and slightly waved. Rostrum 40 μm long, 22 μm wide, nearly lanceolate, not reaching to level of distal end of palp. Rostral setae two pairs as follows: Proximal pair long and thick at just anterior to swollen part of rostrum; distal pair short, at just anterior to proximal pair. Rostral sulcus short, barely reaching to level of proximal rostral setae. Chelicera (Fig. 10B) elongate, with basal segment 76 μm long, 24 μm wide, without clear ornamentation. Movable digit 15 μm long, with 11-12 minute denticles along dorsal edge. Fixed digit 13 μm long, extending slightly proximally to distal end of movable digit. Palp (Fig. 10C) 28 μm long; P-1, length/width 0.38, short and cylindrical; P-2, length/width 0.40, longest and robust, very faintly reticulated, with a long filiform seta distidorsally; P-3, length/width 0.25, short and cylindrical; P-4, length/width 1.75, conical, with three short and thick filiform setae intermediately, and two appressed blunt spiniform projection terminally.

Legs (Fig. 11A-D): Length of legs I, II, III, IV = 208, 208, 214, 214 μm , respectively. Ornamentation indistinct. Each tarsus furnished with claw fossa, without ventral seta. Lateral claw with rake-like accessory process bearing six to eight delicate teeth. Median claw and comb absent.

Carpite short and rod-like. Cavity in claw present. Short seta usually faintly rough, long seta smooth.

Leg chaetotaxy as follows: Trochanters I-IV, 1-1-1-0; basifemora, 2-3-2-2; telofemora, 7-7-5-4; genua, 6-6-3-4; tibiae, 7-7-5-6. As for large bipectinate seta: Genua I-IV, 1-0-0-1; tibiae, 2-1-1-1. Tarsus I (Fig. 12A) with three dorsal setae, one solenidion, one famulus, and four parambulacral setae (paired doublet euphathidia). Solenidion long bacilliform, on posterodorsal surface of claw fossa. Famulus papilliform with fine canaliculus, at just ventrally to solenidion. Tarsus II (Fig. 12B) with three dorsal setae, one solenidion, and four parambulacral setae. Solenidion long bacilliform on posterodorsal surface of claw fossa. Tarsus III (Fig. 12C) with four dorsal setae, and two parambulacral setae (one single euphathidium on posterior surface, one bud-shaped proeuphathidium on anterior surface). Tarsus IV (Fig. 12D) with three dorsal setae (one long robust filiform seta on basidorsal limb, one froned seta on claw fossa, one fine filiform seta on anterodorsal surface), two parambulacral setae (one fine filiform proeuphathidium on posterior surface, one bud-shaped proeuphathidium on anterior surface).

Male (allotype). Idiosoma 332 μm long, 212 μm wide, gnathosomal-length/idiosomal-length 0.22; resembling the female in essential respects except for characters of body size, genitoanal region, and chaetotaxy of tarsus IV.

Body size somewhat smaller than that in the female.

Genitoanal region (Fig. 10D) furnished with a round subsurface pore, and a series of polygonal subsurface pores on each side of genital foramen, bearing terminally tufted 13 and 14 perigenital setae as arranged in Figure 10D. Genital foramen 46 μm long, 18 μm wide. Subgenital setae divided terminally; two setae on each genital sclerite, arranged 2-0. Genital acetabula internal, three pairs. Spermatophorotype (Fig. 10E) 48 μm long, 62 μm wide, massive and rhombic.

Tarsus IV (Fig. 12E) with three dorsal setae (one long robust filiform setae on basidorsal limb, one froned seta on claw fossa, one branched seta on anterodorsal surface of claw fossa), two parambulacral setae (one long plumose proeuphathidium on posterior surface, one bud-shaped

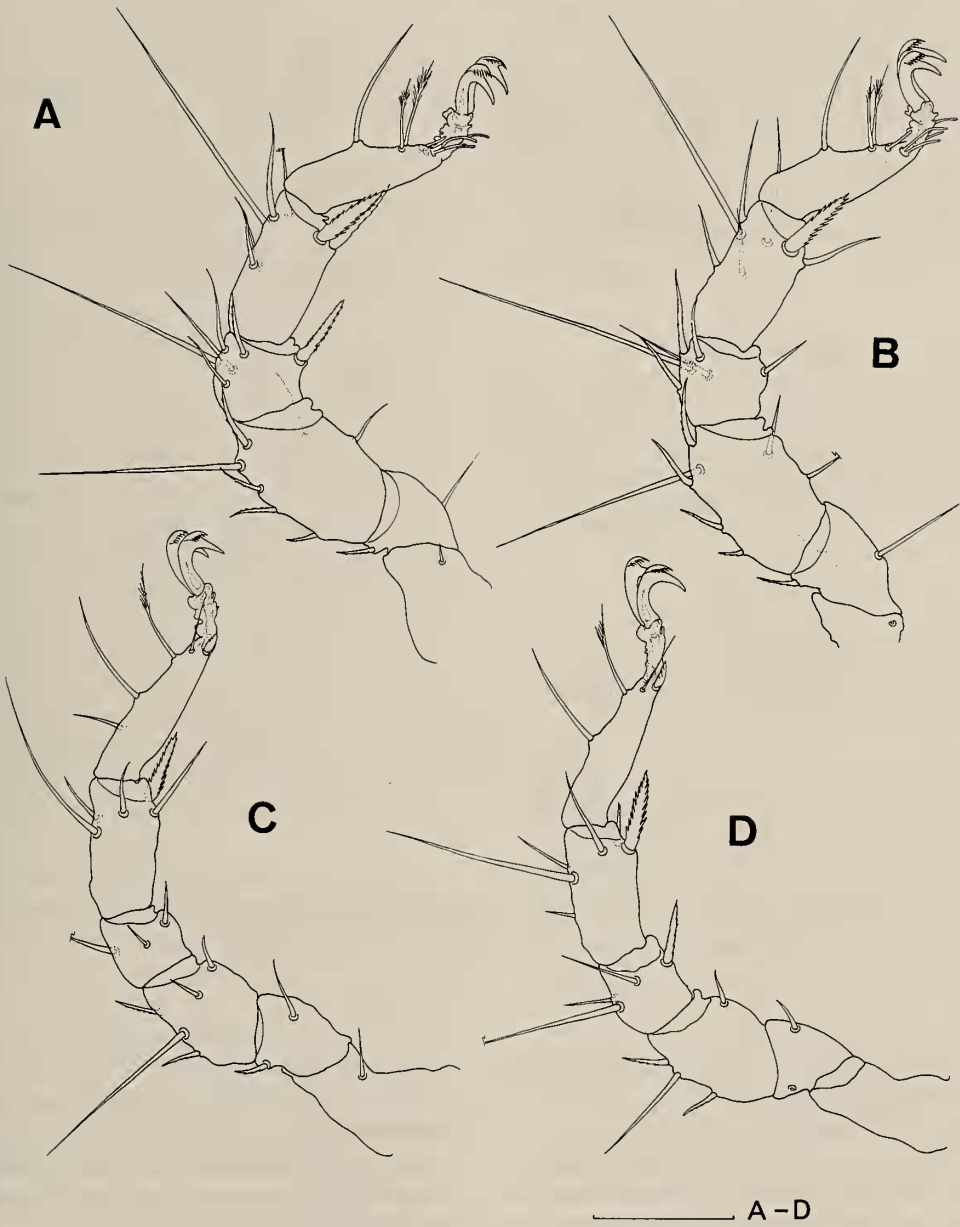


FIG. 11. *Rhombognathus ezoensis* sp. nov., Female (holotype). A, leg I (L); B, leg II (L); C, leg III (L); D, leg VI (L). Scale bar = 50 μ m.

proeuphathidium on anterior surface).

Tritonymph (paratype). Idiosoma 332 μ m long, 196 μ m wide, gnathosomal-length/idiosomal-length 0.20.

Dorsum: AD concave posteriorly. PD convex anteriorly. AD and PD separated by interval

about two times as long as PD. OC with two subsurface pores at posteromedial margin.

Venter: AE furnished with a number of subsurface pores medially as well as along posterior margin, with two aes-ii-adj on each lateral margin. PE furnished with several subsurface pores along

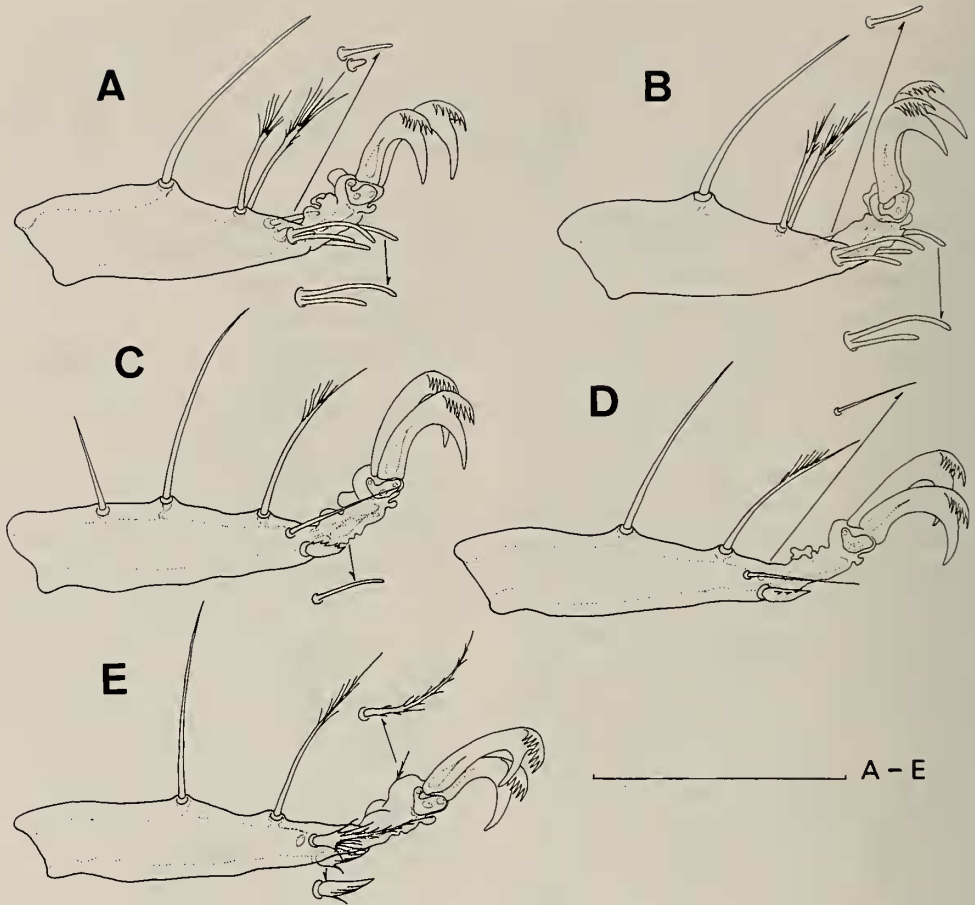


FIG. 12. *Rhombognathus ezoensis* sp. nov., Female (holotype). A, tarsus I (L); B, tarsus II (L); C, tarsus III (L); D, tarsus IV (L). Male (allotype). E, tarsus IV (R). Scale bar=50 μ m.

anteroventral margin. A small subsurface pore placed on membranous cuticle medially on each side, at level of anterior margin of PE.

Genitoanal region (Fig. 10F): Genital plate 64 μ m long, 52 μ m wide, bluntly protruded anteriorly, nearly truncated posteriorly, furnished with two short setae of which one is placed at 0.31, and another at 0.84 on each side, bearing a tiny subsurface pore at 0.43 on each lateral margin. Primordial genital slit occupied from 0.69 to 0.84, with three pairs of internal genital acetabula. Subgenital seta absent. Three minute subsurface pores placed on membranous cuticle slightly anterior to anterior margin of genital plate. Anal plate small, nearly truncated anteriorly.

Legs: Leg chaetotaxy of telofemora I-IV, 6-6-4-4; tibiae, 6-6-5-5. Tarsus with less fringed dorsal seta.

Deutonymph (paratype). Idiosoma 264 μ m long, 168 μ m wide, gnathosomal-length/idiosomal-length 0.19.

Dorsum: AD protruded posteriorly. PD small. Costa indistinct.

Venter: AE with one aes-ii-adj on each lateral margin. Left PE with two pes-iii-adj of which one very minute, whereas right PE with only one pes-iii-adj.

Genitoanal region (Fig. 10G): Genital plate 38 μ m long, 30 μ m wide, furnished with primordial genital slit, with two pairs of internal genital

acetabula. Genital seta absent.

Legs: leg chaetotaxy of basifemora I-IV, 2-3-2-1; telofemora, 4-4-3-2; genua, 5-5-3-4; tibiae, 5-6-5-5. Genu IV with one large but less pectinate seta.

Protonymph and larva: Not collected.

Morphological variation and abnormality: The number of the subsurface pores near the posterior margin of OC varies from two to four. The number of setae aes-ii-adj and pes-iii-adj on each side of the idiosoma in the adult varies from two to three, and one to two, respectively. The number of the perigenital setae on each side of the genital foramen varies from three to five in the female, and 12 to 14 in the male; this number varies according to specimens and even to each side of the genital foramen in one specimen. The leg chaetotaxy of the adult specimens varies as follows: Trochanters I-IV, (0,1)-(0,1)-1-0; basifemora, 2-(2,3)-2-(1.2); telofemora, (6,7)-7-(4,5,6)-(3,4,5); genua, (5,6)-(5,6)-3-4; tibiae, (6,7)-(6,7)-(5,6)-(5,6). One specimen lacks the dorsoproximal seta on tarsus III.

Etymology: The specific epithet is derived from "Ezo", the old Japanese name for Hokkaido.

Distribution: Widespread on the coast of Hokkaido.

Remarks: This new species is distinguishable from other *Rhombognathus* species by the following characters: Separated dorsal plates, two pairs of setae on PD, four pairs perigenital setae with characteristic arrangement (Fig. 9C) in the female, leg chaetotaxy and rake-like accessory process on lateral claw.

Rhombognathus ezoensis closely resembles *R. reticulatus* Krantz, 1976 [8] in the conformation of the dorsal plates and the idiosomal chaetotaxy of the dorsal and epimeral regions. However, *R. ezoensis* is distinctive from *reticulatus* in the follow-

ing characters (corresponding condition in the latter species in parentheses): (1) Perigenital filiform setae short (long); (2) four pairs of perigenital setae (three pairs); (3) leg chaetotaxy of telofemora I-IV, 7-7-5-4; genua, 6-6-3-4 (telofemora I-IV, 6-6-4-4; genua, 6-6-3-3); (4) genital plate completely separated from anal plate in the deutonymph (fused to form a single genitoanal plate).

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